

WHAT IS CLAIMED IS:

1. A method for transferring data, comprising:
  - receiving a request to transfer data;
  - determining whether a counter value equals or exceeds a threshold, the counter value representing an amount of time; and
- 5 transmitting the data when the counter value equals or exceeds the threshold.
2. The method of claim 1 wherein the receiving includes:
  - receiving a request to transfer data via one of a plurality of streams.
3. The method of claim 2 wherein the determining includes:
  - determining whether a counter associated with the one stream equals or exceeds a threshold associated with the one stream.
4. The method of claim 1 wherein the threshold is programmable.
5. The method of claim 1 further comprising:
  - setting the threshold to exceed a flow control delay.
6. The method of claim 1 further comprising:
  - resetting the counter after the transmitting.

7. A network device comprising:  
a transfer request unit configured to generate a request to transfer data;  
a rate limiter configured to control a rate at which data is transferred; and  
an arbiter configured to receive the request and transfer the data at a rate  
5 determined by the rate limiter.

8. The network device of claim 7 wherein the rate limiter includes:  
a counter configured to track an amount of time between data transfers,  
a first register configured to store a threshold value,  
a comparator configured to compare the amount of time to the threshold  
5 value and transmit a signal when the amount of time equals or exceeds the threshold  
value, and  
a second register configured to receive the signal and clear an entry  
indicating that a data transfer is permitted.

9. The network device of claim 8 wherein the threshold value is  
programmable.

10. The network device of claim 8 wherein the threshold value is set to exceed  
a delay associated with a flow control signal.

11. The network device of claim 8 wherein the comparator compares the  
amount of time to the threshold value each cycle.

12. The network device of claim 7 wherein the arbiter transfers the data via one of a plurality of streams.

13. The network device of claim 12 wherein the rate limiter includes:  
a plurality of counters, each counter associated with one of the plurality of streams and configured to store a value representing an amount of time between data transfers via the associated stream,

5 a first register comprising a plurality of entries, each entry corresponding to one of the plurality of streams and configured to store a threshold value,

a comparator configured to:  
compare the counter values to the corresponding entries of the  
register, and

10 transfer a signal when one of the counter values equals or exceeds the threshold value of the associated entry, and

15 a second register comprising a plurality of entries, each entry corresponding to one of the plurality of streams and configured to receive the signal and clear a bit when the entry corresponds to the one counter value, indicating that a data transfer is permitted.

14. The network device of claim 13 wherein the comparator compares at least one counter value to the associated entry of the register every cycle.

15. The network device of claim 13 wherein the threshold value of each of the entries is set to exceed a delay associated with a flow control signal.

16. The network device of claim 12 further comprising:

a transfer register comprising a plurality of entries, each of the entries being associated with one of the plurality of streams and configured to store a data transfer permission bit.

17. The network device of claim 16 wherein the arbiter transfers data for a particular stream based on the data transfer permission bit associated with that stream.

18. The network device of claim 12 wherein the plurality of streams includes 128 streams.

19. A method for preventing a buffer overflow condition, comprising:  
determining a delay associated with transmitting a flow control signal from the buffer to a device that transmits data to the buffer;  
setting a threshold value to equal or exceed the determined delay; and  
limiting transmission of data to the buffer based on the threshold value.  
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20. The method of claim 19 wherein the limiting includes:  
comparing a counter value to the threshold value, the counter value representing an amount of time, and

5 preventing transmission of data to the buffer when the counter value is less than the threshold value.

21. The method of claim 19 wherein the device and buffer are connected via a plurality of streams.

22. The method of claim 21 wherein the plurality of streams includes 128 streams.

23. A system for preventing a buffer overflow condition, comprising:  
5 a register comprising at least one entry configured to store a threshold value, the threshold value equaling or exceeding a delay associated with transferring a flow control signal from the buffer to a device that transmits data to the buffer;

at least one counter configured to store a value representing an amount of time since a previous data transmission to the buffer; and  
10 a comparator configured to:

compare the amount of time to the threshold value, and  
permit transmission of data to the buffer when the amount of time

equals or exceeds the threshold value.

24. The system of claim 23 wherein the device and buffer are connected via 128 streams.

25. The system of claim 24 wherein the register includes 128 entries and the counter includes 128 individual counters, each of the counters being associated with one of the entries.

26. The system of claim 24 wherein the counter contains 4 bits.

27. The system of claim 24 wherein the value in the counter is reset when data is transmitted to the buffer.

28. The system of claim 23 further comprising:  
a second register coupled to the comparator and comprising at least one entry configured to store a bit indicating whether transmission of data is permitted.

29. A method for controlling a reading of data from a buffer, comprising:  
tracking an amount of data read from the buffer;  
determining whether the amount exceeds a threshold; and  
reducing a speed at which data is read when the amount exceeds the

5 threshold.

30. The method of claim 29 further comprising:  
storing a value representing the speed in a register.

31. The method of claim 29 wherein the speed is programmable.

32. The method of claim 29 wherein the reducing the speed includes:  
masking buffer read opportunities.

33. A network device comprising:  
an output buffer configured to store data; and  
a throttle controller configured to:  
track an amount of data read from the buffer, and

5 reduce a speed at which data is read from the buffer when the  
amount of data exceeds a threshold.

34. The network device of claim 33 wherein the throttle controller includes:  
a counter that tracks the amount of data, and  
a mask register configured to store a value representing the speed.

35. The network device of claim 33 wherein the throttle controller reduces the  
speed at which data is read from the buffer by masking out read opportunities.

36. A network device comprising:  
means for receiving a request to transfer data;  
means for determining whether a counter value exceeds a threshold, the  
counter value representing an amount of time between data transfers; and  
5 means for transmitting the data when the counter value exceeds the  
threshold.

37. The network device of claim 36 wherein the threshold is programmable.

38. The network device of claim 36 further comprising:

means for setting the threshold to exceed a flow control delay.

39. A network device comprising:

a first flow control device comprising:

a transfer request unit configured to generate a request to transfer  
data,

5 a rate limiter configured to control a rate at which data is  
transferred, and

an arbiter configured to receive the request and transfer the data at  
a rate determined by the rate limiter; and

a second flow control device comprising:

10 a throttle controller configured to:  
track an amount of data read from a buffer, and  
reduce a speed at which data is read from the buffer when

the amount exceeds a threshold.

40. The network device of claim 39 wherein the rate limiter includes:

a counter configured to track an amount of time between data transfers,  
a first register configured to store a threshold value,

a comparator configured to compare the amount of time to the threshold value and transmit a signal when the amount of time equals or exceeds the threshold value, and  
a second register configured to receive the signal and clear an entry indicating that a data transfer is permitted.

41. The network device of claim 39 wherein the throttle controller includes:  
a counter that tracks the amount of data, and  
a mask register configured to store a value representing the speed.